



Project Summary Report 0-1752-S  
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Project 0-1752: TransLink® Research Program

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## TransLink®: Innovations in Managing the Surface Transportation System

TransLink® was a multi-year, multi-modal research, development, and testing program focused on developing new and innovative methods of improving the efficiency and safety of the entire surface transportation system through integration of systems and the application of advanced technologies. TransLink® researchers examined and developed techniques, procedures, and technologies for linking the various elements of the transportation system with the overall objective of improving the efficiency of the entire surface transportation system (Figure 1). The program was developed through a cooperative partnership between the Federal Highway Administration (FHWA), the Texas Department of Transportation (TxDOT), the Metropolitan Transit Authority of Harris County (METRO), the Texas Transportation Institute (TTI), and Rockwell International.

The goals of the TransLink® research program were as follows:

- Promote and assist in the integration of advanced systems and technologies to improve the safety and operations of the entire surface transportation system, not just one element of the system (Figure 2).



Figure 1. The TransLink® Partners.

- Develop and evaluate advanced ITS technologies and devices for collecting, synthesizing, and disseminating information about roadway and travel conditions so that users of the information can make intelligent and informed travel and control decisions.
- Develop and conduct proof-of-concept testing of advance control algorithms for improving operations and safety of all elements of the surface transportation system.
- Develop tools and materials for training students and professionals in the benefits and applications of advanced ITS concepts and technologies.
- Provide a facility where ITS concepts and technologies can be showcased to transportation professionals, policy makers, and the general public.

### What We Did...

#### The TransLink® Research Program

TransLink® researchers examined the following issues specifically for TxDOT as part of this research project:

- developing and assessing technologies for monitoring train movements in an urban rail corridor,
- archiving and managing ITS data and information,
- assessing new innovations for automating traffic management centers,
- improving cooperation and coordination between incident management response elements, and
- integrating the operations of diamond interchanges and ramp metering systems to improve overall freeway performance.





Figure 2. TransLink®: Linking the Elements of the Surface Transportation System Improves the Efficiency of the Entire Surface Transportation System.

### Development of ITS Laboratories and Testbeds

Located in TTI's Gibb Gilchrist Building, the TransLink® Laboratory is the centerpiece of the TransLink® research and development program (Figure 3). Designed to be flexible and expandable, the TransLink® laboratory is a unique, world-class facility designed to support multiple research, testing, and professional development functions. This 3000-square-foot facility supports 18 individual workstations and more than 15 servers dedicated specifically to ITS research and technology transfer. The laboratory also supports real-time connections to TxDOT traffic management facilities in Dallas and San Antonio.

In addition to the laboratory facilities, TransLink® researchers and staff developed and implemented two outdoor facilities where ITS technologies could be tested in a real-world environment: the Detector Testbed and the Wellborn Road Testbed. Located on SH-6 in College Station, the Detector Testbed provided researchers, practitioners, and vendors with a proving ground to test different traffic sensing and detector technology on a high-speed facility with moderate traffic volumes. The testbed was used to perform side-by-side evaluation of different detector technologies with video and inductive-

loop ground-truthing capabilities. The Wellborn Road Testbed provided an urban environment for developing and testing different traffic signal and rail monitoring capabilities.

### Professional Capacity Building and Technology Transfer Activities

Part of the TransLink® mission was to provide technology transfer through the development of professional capacity building and showcasing activities. TransLink® project funds were used to develop a database of ITS professional development publications. As part of the professional development activities, TransLink® staff examined different strategies for applying distance learning techniques for training ITS professionals (Figure 4). We also focused on developing and training future transportation professionals through the development of educational exercises and software tools geared toward junior high and high school students. TransLink® staff also were active in providing and conducting workshops and training courses on incident detection algorithms for freeway management applications and freeway traffic operations.

### What We Found...

#### Rail Monitoring

TTI researchers developed and implemented a system for monitoring

train movements in an urban corridor. A prototype system was developed and deployed in the Bryan/College Station area to display grade crossing status, and arrival and departure time information. A similar system has been deployed in Sugar Land, Texas, where train arrival and departure time information is being displayed for emergency service responders. The train monitoring technology also serves as the core for a system that has been implemented in Laredo, Texas, where train information is disseminated.

### Identification of the Preemption Trap

A preempt trap occurs when the track clearance phase of a traffic signal, which is designed to move stationary vehicles off the tracks before a train arrives at the crossing, ends before the gates and warning devices are activated. Because the warning lights are not flashing and crossing gates are still vertical, vehicles continue to cross the track and can possibly become trapped on the tracks when the track clearance phase ends. One "quick fix" to the preempt trap is to increase the track clearance green to be equal to the preemption time plus 15 seconds. Providing the additional time, however, will not guarantee that the gates will be down when the track clearance green terminates. The only way to guarantee that the gates will be down when the track clearance green terminates would be to eliminate the variability in the preemption time and the right-of-way transfer time.

### ITS Data Management and Archiving

TTI also developed and implemented a prototype system for retaining, managing, sharing, and analyzing the voluminous data generated by transportation management systems and transforming it into useful information. The system, called DataLink, used TransGuide loop detector data to illustrate the concepts of an ITS data management and archive system.





Figure 3. The TransLink® Research Laboratory.



Figure 4. Professional Development Activities Conducted in TransLink® Laboratory.

### **Incident Management and Coordination**

As part of an effort to build multi-agency support for incident management in the Houston area, the TransLink® Research Center organized the 1998 Houston Emergency Service Workshop. This workshop was held on July 16 and July 17, 1998, under sponsorship of the Texas Department of Transportation in cooperation with the City of Houston, Harris County, the Metropolitan Transit Authority of Harris County, and the Houston TranStar partnership. More than 50 delegates attended the workshop, representing more than 15 different agencies involved with emergency response in the Houston area. The workshop proved successful at fostering interagency coordination and at identifying strategies for improved response to roadway incidents and other types of emergencies.

### **Integration of Diamond Interchange and Ramp Metering**

TTI researchers examined issues associated with integrating and coordinating operational strategies for managing the diamond interchange and ramp metering operations for the purpose of improving system performances. Modeling methodologies were developed for analyzing an integrated diamond interchange–ramp metering system (IDIRMS). A computer model named DRIVE was developed, which is classified as a mesoscopic simulation model.

The model was validated against the VISSIM microscopic simulation model, and researchers found general agreement between the two models. Operational characteristics were also investigated using DRIVE to gain better understanding of the system features.

### **Center-to-Center Communications (C2C) in Low-Bandwidth Environments**

TransLink® investigated the use of C2C in low-bandwidth situations, such as phone line connections. The investigation found that C2C could be deployed in these situations and would effectively transfer the information and control capabilities. This exchange allows smaller centers and operations personnel in smaller districts to participate in a future statewide traffic management network.

At the same time, TransLink® also investigated the use of C2C to form the information-sharing backbone of the College Station Integration Project (CSIP). This project has information and control sharing requirements among four primary partners and the potential for dozens of additional “centers” in the future. The results proved that C2C could be deployed between the various partners and could be used to share the information and control capabilities required for the project. Additionally, the research proved that the C2C specification could be extended for local needs by supplementing the data dictionary

elements with additional information suited to the local project and needs.

### **Use of Real-Time Performance Measures to Assess Freeway Management Operations**

TransLink® investigated the use of these performance measures for real-time feedback so that operational response can be analyzed and adjusted, if necessary, while it is in motion. The research examined appropriate performance measures and developed a framework for including this capability in freeway management systems being deployed by TxDOT.

### **The Researchers Recommend...**

As more and more ITS technologies and devices are developed and deployed in Texas, it is critical that TxDOT continue to develop new concepts, strategies, and innovative strategies for how these systems can be integrated together to improve efficiency and safety of the entire surface transportation system—not just individual elements of the system. Integration is the key to maximizing the return on the investment that TxDOT is making with its ITS deployments. It is through integration and innovation that TxDOT will be able to achieve the primary goal of ITS—getting the right people the right information they need to make the right decision at the right time.



## For More Details...

To learn more about the research projects performed in TransLink®, go to the TransLink® web page at <http://translink.tamu.edu>. A list of research reports prepared in this project can be found at our online catalog at <http://tti.tamu.edu>.

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## TxDOT Implementation Status—February 2005

The TransLink® Research Center develops and implements intelligent transportation systems (ITS) technologies for linking together different elements of transportation issues to improve the overall operation and efficiency of the entire transportation system. The impacts of this research project are ongoing. Laboratory facilities are used actively in TxDOT research and implementation projects as well as in other governmental and private contracts. TransLink® will continue work with TxDOT to serve as a base in research and implementation for further development of ITS technologies.

For more information, contact Mr. Wade Odell, P.E., RTI Research Engineer, at (512) 465-7403 or email [wodell@dot.state.tx.us](mailto:wodell@dot.state.tx.us).

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## Disclaimer

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